

THE HÆMARUMASCOPE.

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A SERIES of experiments, recently undertaken by me with the ordinary modern appliances, in order to determine, if possible, certain physiological points appertaining to the circulation of the blood, could not fail to impress a desire to have at command some more ready and sensitive instrument by which the various minute and delicate qualities and quantities about this latent current could be detected and analyzed.

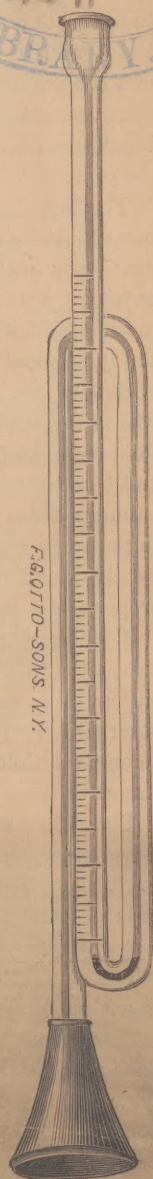
Peculiarities had been always supposed to exist in this element of nice grade and character, important to be noticed and estimated, yet destined apparently forever to elude tactual skill and even defy discovery by means of any instrument of precision hitherto devised.

The instrument, here prefigured was found after many patient trials to aid in refined investigations. Exquisitely sensitive to any impression, however delicate, received from either artery or vein, it may be intended to explore; matters of vast interest and importance relating to the physiology of the circulation, appear revealed by it for leisure study.

This instrument, which I denominate a hæmarumascop¹, consists of a glass tube of fine calibre, free at both extremities, and bent symmetrically upon itself. This configuration has been selected with a view to abridge dimensions and at the same time to secure, when adjusted, a sufficient column of entrapped air to utilize as a highly sensitive and elastic spring. One extremity is expanded in bell-shape, to facilitate accurate coaptation over the trunk of a superficial vessel, to exclude more effectually all external air during process of observation, and to avoid loss of force or volume though impact against upright sides or angles.

Care having been taken to dispense with the interposition of artificial membrane over the vessel, by which the true qualities of a pulse-beat might be vitiated and exaggerated, the instrument here offered I believe to be especially qualified to receive and faithfully impart a full and veracious representation, by means of its contained register, of any pulse characters about to be critically examined.

¹ Αἷμα, blood; ρύμα, stream; σκοπεῖν, to show.



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It has been found important, also, that the diameter of the tube should bear a certain relative proportion to the diameter at the base, in order to render it highly impressionable to every pulse feature which may transpire beneath, when applied for scientific exploration.

The shaft of the tube will be found carefully graduated into centimetres, to facilitate quick estimation of the features to be noted.

In order to prepare the hæmarumascopé for an observation, a fraction of a drop of filtered solution of rose aniline in alcohol, with some essential spirit, must be introduced. The essential spirit is thus employed in combination with a view to its quality to diminish friction within the bore of the tube.

The introduction of this sensitive solution into the calibre of the instrument must be effected with such skill as to insure unbroken solution of continuity in the column of fluid. When so accomplished, the two extremities of the tube being left free, the fluid naturally gravitates to the most depending portion, which is just immediately at the lower bend of the instrument when held in readiness to be applied.

Should the column of fluid, however, at any time become disunited within the shaft of the instrument by accidental admission of air, recondensation can be again readily effected by holding the instrument upright and by means of firm and steady pressure of its larger extremity upon the palmar surface of the hand, force the entire volume of the fluid upward to the smaller extremity. By this simple manœuvre all air bubbles can be expelled, and the return secured of a united column of fluid back to its proper place, ready again for an observation.

No demonstration has ever yet been afforded of characteristic blood-movement within the veins. The manifest difficulties attending the examination of a current so undemonstrative have doubtless deterred many observers from essaying in that direction, and the question still recurs among physiologists respecting the cause and nature of the heartward stream of the circulation.

That there are peculiarities of great therapeutical concern to observe about the venous system none who have carefully considered this subject can deny. The venous system is undoubtedly liable to its own peculiar class of derangements, and from it we have reason to look for most congestive actions.

The manifestation of a palpable venous pulse has always been regarded as a sign of disease; and Niemeyer and others have affirmed that when detected about the veins of the neck, it signifies that regurgitation is taking place actively through the tricuspid valve. Pulsation in veins is certainly rendered more manifest when any obstacle prevents too free flow of the blood through the pulmonary artery, or when the auriculo-ventricular valves fail to close with accuracy the passage in which they are placed.

The learned physiologist, Hales, taught that all the blood which is

emptied by the right auricle into the ventricle below is not accepted by it, but that an appreciable modicum was being continually thrown back into the superior and inferior venæ cavae. The undulation thus produced, he states, had often been detected as far back as the external jugulars and even iliacs. That there must be movement of the blood within the veins, correlative with its centrifugal delivery, admits of no question, and therefore the existence of a venous pulse is rationally implied. This inference naturally sustained me throughout many patient efforts to discover and reveal this motion, though infinitesimal in quantity; and I found the hamarumascopé quite adequate to explore and demonstrate with exactness the rate, force, volume, and other important features pertaining to vein trunks and their manner of transmitting blood.

When this instrument is made to rest firmly and steadily upon the trunk of a superficial vein of sufficient dimensions, the peculiar movement of the stream of blood beneath the bowl of the instrument sets the sensitive fluid column within the tube into sympathetic motion, clearly demonstrating that the blood within the vein receives the shock and experiences augmentation of contents nearly isochronous with the arterial throb. This appears to justify a conclusion that the *vis à tergo*, generated by the heart's action, is not quite exhausted before the threshold of the venous system, and that a sufficient amount of momentum is left over, and acts as a *vis à fronte* to urge the blood onward in its centripetal direction.

Should this instrument be applied with care on a vein even upon the back of the hand, in any favourable subject, and a gentle series of taps, with a pointed instrument, be imparted to the trunk of the vessel just anterior to the bowl of the hamarumascopé and nearest the observer, a very remarkable disturbance, undulatory in character, will be found imparted to the minute register within the tube. This experiment shows that the blood by this act is being urged forward through the valves more rapidly than it would normally travel by coercion at the heart. Let the same manœuvre be now practised upon the trunk of the same vessel, between the instrument and the heart, and quite a contrary effect will be noted. This latter experiment proves, without doubt, that the valvular arrangement within the vessel, together with the *vis à tergo*, is resisting backward flow.

Such experiments may serve admirably to test the degree of tonicity about the fibro-cellular coats of veins and also the integrity of their respective sets of valves.

Should pressure sufficient be now momentarily applied to interrupt the current of blood through the vein, pulsation is observed to be halted; but, so soon as the restraining pressure is removed, the series of agitations manifested by the column of fluid within the tube exhibits the interesting struggle going on within the vein to recover proper equipoise in its circulation.

The introduction therefore of so extremely sensitive a manometer cannot fail to extend the field of physiological research, assist in detecting any deviation from a healthy standard in which the circulation is primarily at fault, facilitate distinction between sthenic and asthenic forms of disease, afford early indications for withholding or administering stimulants, aid in the study of the various idiosyncrasies which present so many obscure problems for investigation, and, finally, lead the way to clearer therapeutical conclusions.